Due: Wednesday, October 11

HMC Math 142 Fall 2017

Prof. Gu

Problem Set 6

Start this assignment before Sunday night!

Read:

- Baby Do Carmo, Differential Geometry of Curves and Surfaces: Sections 2-4, 2-5, 2-6 and Section 5-10 on Abstract surfaces (starting on page 425)
- Handouts 8 and 9
- Lecture Notes

Do:

A: Please do a thorough review for your Midterm I.

B: Problems from Lectures

- a) Let S be a subset of R^3. Show that S is regular surface if and only if S is locally diffeomorphic to R^2.
- b) Find five examples of regular surfaces such that each of them can be represented as a surface of revolution. Write down specifically for each example the generating curve, the rotation axis, and the parameterization (as a map) for the surface (including the domain of the map).

C: Other Problems

- a) Problem 10 on page 81, Section 2-3, Baby Do Carmo.
- b) Problem 9 on page 89, Section 2-4, Baby Do Carmo.
- c) Problem 15 on page 90, Section 2-4, Baby Do Carmo.
- d) Problem 18 on page 90, Section 2-4, Baby Do Carmo.
- e) Problem 1 on page 99, Section 2-5, Baby Do Carmo.

- f) Problem 3 on page 99, Section 2-5, Baby Do Carmo.
- g) Problem 9 on page 100, Section 2-5, Baby Do Carmo.

D: Extra Credit Problems

- a) Let $T \subset R^3$ be a torus of revolution with center in $(0,0,0) \in R^3$ and let $A(x,y,z) = (-x,-y,-z)$. Let K be the quotient space of the torus T by the equivalence relation $p \sim A(p)$. Can you tell what surface K is?
- b) Show that K is a differentiable 2-dimensional manifold.
- c) Show that K is non orientable in two different ways.